



(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Declaration under Rule 4.17:**

— of inventorship (Rule 4.17(iv)) for US only

## CLAIMS

REPLACED BY  
ART 34 AMDT

WE CLAIM:

1. A valve comprising:

a valve body having a valve cavity therein;

5 a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

a single piece packing that surrounds said valve element and seals said valve element within said valve cavity;

10 said single piece packing being dimensioned to be installed on said valve element within a room temperature range.

2. The valve of claim 1 wherein said room temperature range is about 65-100 °F.

3. The valve of claim 1 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85.

15 4. The valve of claim 3 wherein said ratio H/D4 is about 0.8.

5. The valve of claim 1 wherein said valve element comprises a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

20 6. The valve of claim 5 wherein said ratio D3/D1 is about 0.8.

7. The valve of claim 1 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85; and wherein said valve element comprises a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

25

8. The valve of claim 7 wherein said ratio  $H/D_4$  is about 0.8 and said ratio  $D_3/D_1$  is about 0.8.

9. The valve of claim 1 wherein said packing comprises a polymer.

10. The valve of claim 9 wherein said polymer is selected from the group comprising  
5 polytetrafluoroethylene (PTFE), polyethylene, polyetheretherketone (PEEK) and fluorinated ethylene propylene.

11. The valve of claim 1 wherein said valve element comprises a non-spherical flow control element.

12. The valve of claim 1 wherein said packing has an inner surface that forms an  
10 interference fit with said valve element when said packing is installed thereon prior to loading said packing within said valve body.

13. The valve element of claim 1 wherein said packing has an interference fit with said valve cavity when said packing is installed on said valve element and inserted into said valve cavity prior to loading said packing within said valve cavity.

15 14. A method for assembling a valve comprising the steps of:  
forming a one piece packing adapted to seal a valve element within a valve cavity; and  
installing said packing onto said valve element within a temperature range for which  
mechanical properties of the packing are substantially unchanged.

20 15. The method of claim 14 wherein said step of forming said packing comprises the step of machining said packing.

16. The method of claim 14 wherein said temperature range is selected so that the mechanical properties of the packing material are substantially unchanged as compared to the mechanical properties of the packing material at 70 °F.

25 17. A valve comprising:  
a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

a packing that surrounds said valve element and seals said valve element within said valve cavity; and

5        said valve element comprising a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

18.    The valve of claim 17 wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of  
10    about 0.75 to about 0.85.

19.    The valve of claim 17 wherein said packing comprises a polymer that is selected from the group consisting of: PFA, filled PFA, polytetrafluoroethylene (PTFE), filled PTFE, polyethylene, polyetheretherketone (PEEK) and fluorinated ethylene propylene.

20.    The valve of claim 17 wherein said packing is dimensioned to be installed on said  
15    valve element at a temperature below which said packing deforms.

21.    The valve of claim 20 wherein said temperature is room temperature.

22.    The valve of claim 17 wherein said packing is a single piece packing.

23.    The valve of claim 17 wherein said packing is over molded onto said valve element.

20        24.    A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

25        a packing that surrounds said valve element and seals said valve element within said valve cavity; and

said valve element comprising a ball and adjacent upper and lower trunnions;

wherein said packing has a generally cylindrical outer surface defined by a height H and an outer diameter D4, said packing having a ratio H/D4 of about 0.75 to about 0.85.

25. The valve of claim 24 wherein said ball has an outer diameter D1 and at least one  
5 of said trunnions has an outer diameter D3; wherein said valve element has a ratio D3/D1 of about 0.7 to about 0.9.

26. The valve of claim 24 wherein said packing is a single piece packing.

27. The valve of claim 24 wherein said packing is a multi-piece packing.

28. The valve of claim 24 wherein said packing is installed onto said valve element at  
10 room temperature.

29. In combination, a valve element and a single piece packing therefore, wherein said packing is installed onto said valve element at room temperature.

30. The combination of claim 29 wherein said valve element comprises a ball and stem and with at least one trunnion adjacent said ball.

15 31. A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

a packing that surrounds said valve element and seals said valve element within said  
20 valve cavity;

said valve element comprising a ball and adjacent upper and lower trunnions; said ball having an outer diameter D1 and at least one of said trunnions having an outer diameter D3; wherein said valve element has a ratio D3/D1 that facilitates assembly of said packing onto said valve element at room temperature.

25 32. A valve comprising:

a valve body having a valve cavity therein;

a valve element for controlling flow through the valve based on rotational position of the valve element about an axis; and

5 a packing that surrounds said valve element and seals said valve element within said valve cavity;

said valve element comprising a ball and adjacent upper and lower trunnions; said valve cavity being dimensioned to closely receive said valve element while permitting said valve element to axially shift to compensate for temperature effects on said packing.

10 33. The valve of claim 32 wherein said valve cavity comprises a reduced diameter bore that receives said lower trunnion and prevents packing material from creeping below said lower trunnion.

34. The valve of claim 32 wherein said packing is live loaded.